

## **Claims**

We claim:

1. A variable phase delay line, comprising:  
an RF transmission line;  
a structure defining a fluid channel having a serpentine configuration coupled to said RF transmission line along at least a portion of a length of said transmission line;  
and  
  
at least one fluid control system for adding and removing fluidic dielectric to said fluid channel in response to a phase delay control signal;  
wherein a phase delay of said RF transmission line is selectively varied by at least one of adding and removing said fluidic dielectric from said fluid channel
2. The phase delay line according to claim 1 wherein said fluidic dielectric has a permeability and a permittivity selected for maintaining a constant characteristic impedance along an entire length of said RF transmission line.
3. The phase delay line according to claim 1 wherein said transmission line is also coupled to a solid dielectric substrate material.
4. The phase delay line according to claim 3 wherein the effective index describing the velocity of a wave on said RF transmission line is varied by adding and removing said fluidic dielectric from said fluid channel.
5. The phase delay line according to claim 3 wherein said solid dielectric substrate is formed from a ceramic material.
6. The phase delay line according to claim 3 wherein said solid dielectric substrate is formed from a low temperature co-fired ceramic.

7. The phase delay according to claim 3 wherein said fluidic dielectric has at least one of a permittivity and a permeability that is different as compared to said solid dielectric substrate.

8. The phase delay line according to claim 1 wherein said fluidic dielectric is comprised of an industrial solvent.

9. The phase delay line according to claim 1 wherein said fluidic dielectric is comprised of an industrial solvent having a suspension of magnetic particles contained therein.

10. The phase delay line according to claim 9 wherein said magnetic particles are formed of a material selected from the group consisting of ferrite, metallic salts, and organo-metallic particles.

11. A constant phase delay line, comprising:

an RF transmission line;

a structure defining a fluid channel having a serpentine configuration coupled to said RF transmission line along at least a portion of a length of said transmission line; and

at least one fluid control system for adding and removing a fluidic dielectric to said fluid channel in response to a phase delay control signal;

wherein a phase delay of said RF transmission line is maintained constant as an operational frequency of said RF transmission line is varied, said phase delay maintained constant by at least one of adding and removing said fluidic dielectric from said fluid channel.

12. A method for producing a variable phase delay for an RF signal comprising the steps of:

propagating said RF signal along an RF transmission line; and

adding a fluidic dielectric into a fluid channel having a serpentine configuration and being coupled to said RF transmission line along at least a portion of a length of

said transmission line, said fluidic dielectric being added to selectively control said coupling to vary a phase delay of said transmission line.

13. The method according to claim 12 further comprising the step of subsequently removing a portion of said fluidic dielectric from said fluid channel.

14. The method according to claim 12 further comprising the step of selecting a permeability and a permittivity for said fluidic dielectric for maintaining a constant characteristic impedance along an entire length of said RF transmission line.

15. The method according to claim 12 further comprising the step of coupling said RF transmission line a solid dielectric substrate material.

16. The method according to claim 15 further comprising the step of forming said solid dielectric substrate from a ceramic material.

17. The method according to claim 15 further comprising the step of selecting a material for said solid dielectric substrate to be a low temperature co-fired ceramic.

18. The method according to claim 15 further comprising the step of selecting said fluidic dielectric to have at least one of a permittivity and a permeability that is different as compared to said solid dielectric substrate.

19. The method according to claim 12 further comprising the step of selecting said fluidic dielectric to have at least one of a permeability and a permittivity selected for maintaining a constant characteristic impedance along a length of said RF transmission line.

20. The method according to claim 12 further comprising the step of selecting a material for said fluidic dielectric to include an industrial solvent.

21. The method according to claim 12 further comprising the step of selecting a material of said fluidic dielectric to include an industrial solvent having a suspension of magnetic particles contained therein.

22. The method according to claim 21 further comprising the step of selecting said magnetic particles from the group consisting of ferrite, metallic salts, and organo-metallic particles.

23. A method for producing a constant phase delay for an RF signal comprising the steps of:

propagating said RF signal along an RF transmission line; and

adding a fluidic dielectric into a fluid channel having a serpentine configuration and being coupled to said RF transmission line along at least a portion of a length of said transmission line, said fluidic dielectric being added to selectively control said coupling to maintain a constant phase delay of said transmission line as a frequency of said RF signal is varied.